

## PATENT ABSTRACTS OF JAPAN

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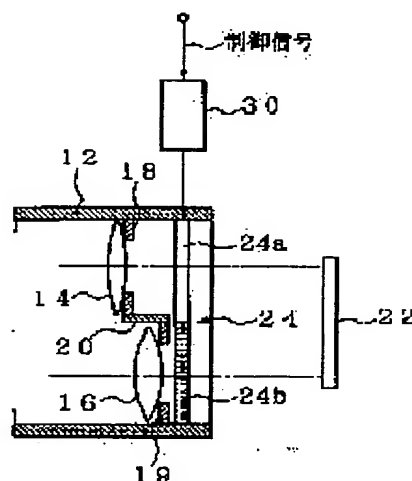
## (54) MULTI FOCUS CAMERA

## (57)Abstract:

PROBLEM TO BE SOLVED: To realize a multi-focus camera by using a simple multi-focus optical system.

SOLUTION: Plural optical systems 14 and 16 are arranged at different distances from an image pickup surface, and a shutter 24 is arranged between the optical systems 14, 16 and the image pickup surface, and by controlling the shutter 24, one optical system is selected out of plural optical systems 14 and 16, and the object image is formed on the image pickup surface through the selected optical system. The optical system is constituted of 1st and 2nd optical systems, and also, fixed focus lenses having different focal distances are used in the respective systems. When the optical system 14 is selected, the image of a normal screen size is obtained, on the other hand, when the optical system 16 is used, the image of a wide image size is obtained. The multi-focus system camera is obtained by using inexpensive fixed lenses.

多焦点カメラ 10



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] A multi-focal camera characterized by having chosen one optical system in two or more optical system, and being made as [ carry out / a photographic subject image through this optical system / to the above-mentioned image pick-up side / image formation ] by allotting two or more optical system to a different distance to an image pick-up side, allotting a shutter between these optical system and the above-mentioned image pick-up side, and controlling the above-mentioned shutter.

[Claim 2] The above-mentioned optical system is a multi-focal camera according to claim 1 characterized by using a fixed focus lens with which focal distances differ, respectively while consisting of the 1st and 2nd optical system at least.

[Claim 3] Each optical system is a multi-focal camera according to claim 1 characterized by enabling it to picturize a photographic subject image with depth by using a fixed focus lens with the almost same focal distance, while the above-mentioned optical system consists of the 1st and 2nd optical system at least, changing the 1st and 2nd optical system of the above one by one, and picturizing the same photographic subject image.

[Claim 4] It is the multi-focal camera according to claim 1 characterized by using CCD, a CMOS sensor, or a silver halide film as an image sensor of the above-mentioned photographic subject image.

[Claim 5] The above-mentioned shutter is a multi-focal camera according to claim 1 characterized by using a dimming element using a liquid crystal device or deposit lytic reaction.

[Claim 6] A multi-focal camera according to claim 5 characterized by extracting to this shutter and adding a function by controlling a opening field for shutter closing motion when using a liquid crystal device as the above-mentioned shutter.

[Claim 7] The above-mentioned photographic subject image is a multi-focal camera according to claim 1 characterized by being a dynamic image or a static image.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention is applied to a video camera, a still camera, etc., and relates to a suitable multi-focal camera. It is made like that it seems that a photographic subject image with a wide screen or depth can be picturized by fixing two or more optical system in the condition of having differed in the distance from an image pick-up side, in detail, and choosing one of two or more optical system if needed.

[0002]

[Description of the Prior Art] In order to realize many foci as optical system used with a video camera, a still camera, etc., two or more fixed focus lenses are combined using the zoom lens which consisted of two or more sheets, and the thing of a configuration of changing a focus is known for the former, carrying out movable [ of the lens ].

[0003] In the optical system of such many foci, since the configuration of the optical-system device section not only becomes complicated, but has moving part, it is in the inclination for a mechanism element to also become very large.

[0004] In order to solve such a problem, the optical system which used the multifocal lens which can simplify the device section of optical system substantially is proposed. With the optical system which used this multifocal lens, an optical lens system is fixed in a camera cone, instead the lens of a multi-focal type is used as an optical lens system. The same function as a zoom lens etc. can be attained by picturizing changing a focus according to a photographic subject image.

[0005] As a multifocal lens, the Fresnel lens which consisted of two or more zona-orbicularis lenses with which focal distances differ was used, and the multifocal lens is realized by choosing a zona-orbicularis lens as indicated by JP,5-30829,U. The same technology also as JP,4-34631,A is indicated.

[0006]

[Problem(s) to be Solved by the Invention] By the way, when using the multifocal lens of a stationary type which is indicated by the well-known reference mentioned above, while the Fresnel lens for realizing many foci is expensive, in order to have to control this Fresnel lens appropriately according to a photographic subject image, it is in the inclination which also complicates a control system. Therefore, a large cost cut cannot be aimed at.

[0007] Then, this invention solves such a conventional technical problem, and realizes a multi-focal camera using the optical system of a simpler multi-focal type.

[0008]

[Means for Solving the Problem] In order to solve an above-mentioned technical problem, with a multi-focal camera concerning this invention indicated to claim 1 By allotting two or more optical system to a different distance to an image pick-up side, allotting a shutter between these optical system and the above-mentioned image pick-up side, and controlling the above-mentioned shutter It is characterized by having chosen one optical system in two or more optical system, and being made as [ carry out / a photographic subject image through this optical system / to the above-mentioned image pick-up side / image formation ].

[0009] In this invention, two or more optical system of a fixed focus is prepared, and to an image pick-up side, these differ in distance, respectively and are being fixed. A shutter is allotted to an optical path between optical system and an image pick-up side, and one optical system in two or more optical system by controlling this shutter is chosen. A photographic subject image carries out image formation to an image pick-up side through selected optical system.

[0010] When using optical system from which a focal distance differs, an image change, such as a wide image pick-up and the usual image pick-up, can be performed by choosing optical system. When using optical system of almost same focal distance, since the same photographic subject image can be picturized to an image pick-up side in the state of an exaggerated focus and undershirt focus and the focus of some kinds just, such as a focus, by choosing optical system, a photographic subject image with a feeling of depth is obtained.

[0011]

[Embodiment of the Invention] Then, 1 operation gestalt of the multi-focal camera concerning this invention is explained to details with reference to a drawing. While using two or more optical system which consisted of this invention with the fixed focus lens, it differs in distance to image sensors, such as CCD, and these optical system is fixed. The case where the optical system from which a focal distance differs as optical system is used, and the case where the optical system of the almost same focal distance is used can be considered. The case where the optical system from which a focal distance differs first is used is explained.

[0012] Drawing 1 is the block diagram of an important section showing the 1st operation gestalt of the multi-focal camera which applied this invention to the video camera, and this drawing has illustrated only the relation between a camera cone 12 and the image pick-up means 22. Two or more optical system is allotted in a camera cone 12. With this operation gestalt, the optical system 14 and 16 which is two from which a focal distance differs shifts the distance over an image sensor 22, and is fixed.

[0013] What has the focal distance  $f_1$  of the 1st optical system 14 longer than the focal distance  $f_2$  of the 2nd optical system 16 is used. For example, when a 6.85mm lens is used, as for  $f_1$ , a 4.0mm lens is used as  $f_2$ . Therefore, when the 1st optical system 14 is constituted from a single lens, plane of incidence can use the concavo-convex lens with which the outgoing radiation side was made with the convex on a concave surface. Moreover, when the 2nd optical system 16 also uses a single lens, the convex convex lens both whose plane-of-incidence and outgoing radiation sides are also convexes is used.

[0014] The 1st optical system 14 with a long focal distance is fixed through the fixed means 18 using the space of the upper half in a camera cone 12. Similarly, the 2nd optical system 16 with a short focal distance is further fixed to the predetermined location by the side of before (image sensor 22 side) through the fixed means 19 using the space of the lower half in a camera cone 12 from the location where the 1st optical system 14 was fixed. Between the fixed means 18 and 19, it is covered with a board 20 so that light may not leak mutually.

[0015] The image sensor 22 is arranged in the location which can carry out image formation also of the photographic subject image from which optical system 14 and 16. Although CCD etc. can be considered as an image sensor 22, a film is used instead of an image sensor at the time like a still camera, and an image pick-up side turns into a film plane.

[0016] It is the optical path of optical system 14 and 16 and an image sensor 22, and a shutter 24 is further allotted in a camera cone 12. This shutter 24 is for carrying out light transmission of the optical path of the 1st optical system 14, and the optical path of the 2nd optical system 16 selectively, or shading, and makes each field of a slash graphic display mentioned later the field of an expedient top halftone dot graphic display of explanation, or the thing in a protection-from-light condition.

[0017] When a shutter 24 can use a liquid crystal device (LCD) and the dimming element (ECD:Electro Chemical Deposition) using deposit lytic reaction and it uses a controllable shutter electrically in this way, as shown in drawing 1, the shutter control means 30 is established, and light transmission and a protection-from-light condition are controlled for this based on control signals, such as a focal adjustment signal.

[0018] Drawing 2 shows this control state typically, and the field (chain-line graphic display)

doubled with the lens opening is controlled by the example of drawing by light transmission / protection-from-light condition with a control signal. For example, if the shutter field which includes the optical path of an aperture and others for the optical path over the 2nd optical system 16 is closed, it will be in a shutter switching condition like drawing 3 . With this, when opening the optical path over the 1st optical system 14 in reverse, a shutter 24 is controlled like drawing 4 .

[0019] Closing motion control of a shutter 24 may not be the control which corresponds to a lens opening. For example, you may make it control to carry out light transmission of the field in the right half of the left (or vertical one half), or to shade, as shown in drawing 5 or drawing 6 .

[0020] When using a liquid crystal device as a shutter 24, it is also possible to extract a light transmission field from the diameter of a opening of a continuous line to a diameter of a opening like a chain-line graphic display like drawing 3 . Since the amount of incident light is controllable by controlling this diameter of a opening, the same function as the usual throttling control can be given. The signal which shows the brightness of outdoor daylight is further supplied to the control means 30 shown for doing in this way at drawing 1 .

[0021] Now, when picturizing a photographic subject image using the 1st optical system 14, it becomes like drawing 7 , and when picturizing a photographic subject image using the 2nd optical system 16, it becomes like drawing 8 . When the image pick-up screen when using the 1st optical system 14 is the usual drawing size, if it is used changing this to the 2nd optical system 16, it will turn around the image pick-up screen at that time one, and it will serve as big drawing size (wide screen) from the usual drawing size. Therefore, what is necessary is just to choose the 2nd optical system 14 to obtain a screen wider than a tele screen (the usual screen). Therefore, the drawing size selection signal of manual actuation will be supplied to the control means 30 of drawing 1 .

[0022] Then, the 2nd operation gestalt is explained. The 2nd operation gestalt is the case where the multi-focal camera 10 is constituted using two or more optical system used as the focal distance the same as optical system, or almost same. Thus, when using two or more optical system of the same focal distance, a photographic subject image with a feeling of depth can be picturized. Although what is necessary is just to use at least two optical system for taking out a feeling of depth, the case where the multi-focal camera 10 is constituted from an operation gestalt shown in drawing 9 using three optical system is shown.

[0023] Like drawing 9 , three optical system 30, 32, and 34 which consisted of single lenses, respectively is fixed in a camera cone 12 in sequence as shown in drawing using the fixed means 40, 42, and 44, respectively. Shields 46 and 48 are attached so that the light from a mutual optical path may not leak mutually.

[0024] And in the example of a graphic display, when based on the 2nd optical system 32 located in the medium, it is fixed to the location which the 1st optical system 30 left most distantly to the image sensor 22, and the 3rd optical system 34 is fixed to the nearest location. The clearance of the 1st optical system 30 over the 2nd optical system 32 and the clearance of the 3rd optical system 34 over the 2nd optical system 32 are chosen identically.

[0025] The shutter 24 allotted to the front face of optical system 30, 32, and 34 is controlled to be able to open and close three optical paths, respectively (light transmission and protection from light). It is also possible to open and close the optical path of two or more arbitration simultaneously.

[0026] An image sensor 22 is put on the location as for which the photographic subject image by which image formation was carried out through the 2nd optical system 32 carries out a focus just while it is arranged so that a part of image of the 1st - the 3rd optical system 30-34 may overlap and may be picturized. By this, since the focus of the photographic subject image projected through the 1st optical system 30 will be just carried out to the front face of an image sensor 22, it will be in an undershirt focus condition and will carry out image formation to an image sensor 22.

[0027] Moreover, in using the 3rd optical system 34, since the focus of the photographic subject image projected through this optical system 34 will be just carried out to the rear face of an image sensor 22, it will be in an exaggerated focus condition and will carry out image formation

to an image sensor 22.

[0028] thus, when picturizing the photographic subject 50 which has depth to optical system like drawing 10 by considering as the multi-focal camera 10 which has three foci Since locations P1, P2, and P3 different, respectively serve as a point which carries out a focus just, if the 1st, 2nd, and 3rd optical system 30, 32, and 34 is changed one by one and the same photographic subject 50 is picturized, it will become an image with a feeling of depth, and will be obtained.

[0029] Although the case where it constituted from a lens single as optical system 14, 16, 30, 32, and 34 mentioned above was explained, it can also constitute as a compound lens which combined two or more lenses. On the optical path between an image sensor 22 and a shutter 24, optical elements, such as cover glass, an infrared cut filter, and an optical low pass filter, may be prepared. The location of a shutter 24 may be put on a photographic subject image side. That it is applicable even if [ both ] it is a video camera and a still camera can understand easily the multi-focal camera 10 concerning this invention.

[0030]

[Effect of the Invention] As explained above, in this invention, two or more optical system of a fixed focus is prepared, and while changing distance and arranging these to an image pick-up side, as a shutter is attached in the front face of optical system and an optical path is chosen, a multi-focal camera is realized.

[0031] According to this, since there is no moving part to optical system, the configuration of optical system becomes very easy. Moreover, although it drops off using an expensive lens like a Fresnel lens, since the cheap lens marketed can be used, it has the feature which can realize a multi-focal camera at low cost including the control system.

[0032] Therefore, this invention is applied to image pick-up systems, such as a video camera and a still camera, and is very suitable.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the cross section of an important section showing 1 operation gestalt of the multi-focal camera concerning this invention.

[Drawing 2] It is explanatory drawing of a shutter.

[Drawing 3] It is drawing showing the switching condition of a shutter (the 1).

[Drawing 4] It is drawing showing the switching condition of a shutter (the 2).

[Drawing 5] It is drawing showing the switching condition of a shutter (the 3).

[Drawing 6] It is drawing showing the switching condition of a shutter (the 4).

[Drawing 7] It is drawing showing the example of an activity when obtaining the usual drawing size.

[Drawing 8] It is drawing showing the example of an activity when obtaining wide drawing size.

[Drawing 9] It is the cross section of an important section showing other operation gestalten of the multi-focal camera concerning this invention.

[Drawing 10] It is the explanatory drawing.

[Description of Notations]

10 [ ... An image sensor, 24 / ... A shutter, 30 32, 34 / ... The optical system with the same focal distance ] ... A multi-focal camera, 12 ... 14 A camera cone, 16 ... The optical system, 22 from which a focal distance differs

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